

# Workshop on Machine Learning for Analysis of High-Energy Cosmic Particles



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Contribution ID: 37

Type: **not specified**

## Searching for Rare Astrophysical Events with Rare AI

*Thursday, 30 January 2025 15:50 (45 minutes)*

Rare event searches are fundamental to our understanding of crucial astrophysical phenomena, including neutrinoless double beta decay, dark matter detection, and binary black hole mergers. While artificial intelligence has revolutionized many scientific fields, its application to rare event searches presents unique challenges due to the inherent scarcity of training data. This talk presents two innovative AI solutions specifically developed for rare event searches in physics and astronomy. First, we introduce a Rare Event Surrogate Model, initially designed for optimizing neutrinoless double-beta decay detectors, with planned extensions to binary black hole merger simulations. Second, we discuss our AI-ready data release from a cutting-edge axion dark matter detector, demonstrating significant improvements in dark matter search sensitivity through AI-driven analysis. These developments showcase how carefully tailored AI approaches can overcome the challenges of limited data availability while enhancing our capability to detect and analyze rare astrophysical events.

### Type of Contribution

**Presenter:** Prof. LI, Aobo

**Session Classification:** Talks